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1228679

DRAWINGS ATTACHED

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(54) PERCUSSION BIT

(71) We, KENNAMETAL INC., a corporation of the State of Pennsylvania, United States of America, of One Lloyd Avenue, Latrobe, Pennsylvania, 15650, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to percussion bits and is particularly concerned with a bit of this nature having a novel placement and combination of hard cutting inserts mounted in the cutting or working face thereof.

Percussion bits are, of course, well known, and take the form of steel bodies, generally forged, which are mounted for reciprocation and rotation and drill by breaking out material against which they impact.

Bits of this nature may have inserts mounted in the form of blocks with wedge-shaped outer faces on the cutting or working face, or may have cylindrical inserts having rounded outer ends mounted therein. Sometimes the bits employ a combination of block inserts and cylindrical inserts but, in such cases, the cylindrical inserts are usually located in the center of the working face of the bit and are provided to break up the central core taken by the bit. In other cases, the working faces of the bits have only cylindrical inserts mounted therein.

The present invention proposes to employ a combination of block inserts and cylindrical inserts in a way which increases the rate at which the bit cuts and also substantially increases the useful life of the bit.

According to the present invention, there is provided a rotary percussion bit comprising; a bit body substantially circular in cross section perpendicular to its axis of rotation and tapering outwardly toward the working face thereof at one end of hhe body, the working face of said bit body being substantially perpendicular to said axis at least one pair of substantially diametrically opposite non-radial slots in said working face of said bit body and blocks of hard wear resistant material fixed in and protruding from said slots in the axial direction of said bit body, the protruding portion of said blocks being wedge shaped said bit body having holes in the working face thereof circumferentially spaced from each other and from said blocks, said holes being located near the periphery of said working face and having their axes inclined to said axis so as to converge therewith toward the other end of said bit body, and cylindrical inserts of hard wear resistant material fixed in said holes and protruding therefrom and extending, when the working face is viewed in plan, in the radial direction substantially to the periphery of the working face of said bit body, the protruding outer end of each cylindrical insert being rounded.

A particular object of the present invention is the provision of a novel bit construction which employs both block inserts and cylindrical inserts as primary cutting and breaking elements.

A further object of the present invention is the provision of a percussion bit which will have a more rapid penetration rate than heretofore known bits.

Still a further object of this invention is the provision of a percussion bit which has substantially longer life than previously known percussion bits.

Still a further object of this invention is the provision of a percussion bit which is relatively easy to manufacture but which is characterized in long life and a rapid penetration range.

These and other objects and advantages of the present invention will become more apparent upon reference to the following detailed specification taken in connection with the accompanying drawings in which:

Figure 1 is a side view, partly broken away, of a rotary percussion bit constructed according to the present invention;

Figure 2 is a view looking in at the bottom or working face of the bit of Figure 1:

Figure 3 is a vertical longitudinal section through the bit and is indicated by line III-III on Figure 2;

Figure 4 is a sectional view through the lower portion only of the bit body and is indicated by line IV-IV on Figure 2;

Figure 5 is a fragmenary sectional view indicated by line V-V on Figure 2; and

Figure 6 is a fragmentary view showing a modified type of blade-shaped insert.

Referring to the drawings somewhat more in detail, the bit illustrated therein comprises a body 10 which is substantially circular in cross-section and which has a central hole 12 which is provided with threads 14. In other types of bits, the bit can be operatively connected to the lower end of a drilling rig by other means, such as splines.

Body 10 tapers generally outwardly from its smaller upper end to a larger lower end 18 and which lower end 18 is the working end of the bit. The bit terminates in a working face 20. The working face 20 is provided with circumferentially spaced grooves or slots 22, each of which is non radial, relative to the longitudinal axis of the bit body. Slots or grooves 22 are parallel and are offset laterally from a certain diameter of the bit body. Grooves 22 are adapted for receiving cutting inserts 24 of a hard material, such as cemented tungsten carbide. Inserts 24 are in the form of blocks and in cross section, have a rectangular portion which is disposed in the respective groove and a gabled, or wedge shaped, portion which protrudes from the working face of the bit body. In the bit shown, as will best be seen in Figure 2, two of the inserts 24 are provided substantially diametrically opposite each other and having their longitudinal axes parallel but laterally offset in respective opposite directions from a diameter parallel to the said axes.

Interposed between the cutting inserts 24, and circumferentially spaced from each other, and also from the inserts 24, are cylindrical rod-like, or button type, inserts 26 or hard material such as cemented tungsten carbide. In the bit illustrated, four of the cylindrical inserts 26 are provided. Each of these inserts, as will be seen in Figure 4, is in the form of a relatively short rod-like member rounded at its projecting outer end. The inserts 26 are mounted in holes 28 drilled into the bottom of the bit body. Holes 28, as will be seen in Figure 4, are angular to the axis of the bit body so the inserts 26 will be effective at the periphery of the hole being cut by the bit.

The inserts 24, 26 may be brazed in place and thus solidly affixed to the bit body but it has also been found satisfactory to press the cylindrical inserts 26 into holes drilled to a size to provide an interference fit.

As the bit operates it will be evident that there will be a certain region located radially inwardly of the inner ends of cutting inserts 24 that will not be directly engaged by any of the cutting inserts, and this might tend to build up a core-like projection in the center of the hole that would interfere with continued cutting of the material in the bottom of the hole. This core-like projection is readily removed by the provision of one or more small cylindrical inserts 30 each mounted in a respective hole 32, provided therefor as shown in Figures 2 and 3. Each insert 30 protudes from the working face of the bit body and may have its axis parallel to, or inclined to, the axis of the bit body.

As will best be seen in Figure 2, the bit body is provided with a plurality of longitudinal flutes 34 extending along at least the enlarged lower end part 18 of the bit body. These flutes provide passage for the crushed material loosened up by the bit so that the bit can proceed on downwardly in the hole being drilled.

Further, air under pressure may be supplied to the central hole 12 which can pass downwardly to the bottom of the bit via the drilled passages 36 which will be seen in Figures 2 and 5. Each of these passages communicates at its lower end with a laterally extending groove 38 which leads radially outwardly into communication with the flutes 34 which are disposed between the inserts 26 on each side of the bit body.

In known bits, having either block inserts, or cylindrical inserts, in the working face, the bit body tapers inwardly in the upward direction at an angle of about 3 degrees on each side, namely, at about a 6 degree included angle. It has been found with the bit of the present invention, however, the life thereof is so much greater than the life of the known bits, that it is of advantage to taper at least the larger lower end portion 18 at a substantially greater angle, about 6 to 8 degrees on each side having been found to be satisfactory. The greater angle of the bit body facilitates regrinding of the periphery of the body after the inserts 24 commence to round at their outer corners. Such regrinding of the bit body will restore the bit to initial operating efficiency. With the body tapered at the greater angle as aforesaid, the steel of the body will readily wear away with the outer surface of the inserts and the bit will not wedge in the hole.

A further feature of the bit of the present invention is to be found in the added reliefs indicated at 40 in Figures 1 and 3 and disposed axially behind the block inserts 24. The relief regions 40 permit easier grinding of the

bit body and likewise permit the steel to wear away more easily as the radially outer ends of the inserts 24 wear down.

As will be seen in Figure 4, the working face 20 is bevelled at 42 in the region of the holes 28. This makes it easier to drill the holes 28 and also produces effective exposure of the outer ends of inserts 26.

Figure 6 shows how a block insert 24*a* could have the outer end bevelled as at 50. The sharp peaks 52 on the insert would continue clear to the end of the insert, as would the inclined side walls forming the sharp peaks but, at the outer end of the insert the angularity thereof would be changed as shown in Figure 6. When inserts 24*a* are shaped as shown in Figure 6, the bit stays sharp longer than when the inserts are shaped as in Figure 1.

In the case of either modification, the bit seems to combine a cutting action with a breaking action as the bit is rotated and impacted on the bottom of the hole and a rapid boring action is then obtained.

Only two specific embodiments of the invention have been illustrated and described herein, but it will be understood that other modifications and adaptations can be arrived at falling within the purview of the appended claims.

WHAT WE CLAIM IS:—

1. A rotary percussion but comprising; a bit body substantially circular in cross section perpendicular to its axis of rotation and tapering outwardly toward the working face thereof at one end of the body, the working face of said bit body being substantially perpendicular to said axis, at least one pair of substantially diametrically opposite non-radial slots in said working face of said bit body and blocks of hard wear resistant material fixed in and protruding from said slots in the axial direction of said bit body, the protruding portion of said blocks being wedge shaped, said bit body having holes in the working face thereof circumferentially spaced from each other and from said blocks, said holes being located near the periphery of said working face and having their axes inclined to said axis so as to converge therewith toward the other end of said bit body, and cylindrical inserts of hard wear resistant material fixed in said holes and protruding therefrom and extending, when the working face is viewed in plan, in the radial direction substantially to the periphery of the working face of said bit body, the protruding outer end of each cylindrical insert being rounded.

2. A percussion bit according to Claim 1 in which at least one further cylindrical insert of hard wear resistant material having a rounded outer end is mounted in said bit body and protrudes from the working face of said bit body in the region radially inwardly from the radially inner ends of said blocks.

3. A percussion bit according to Claim 2 in which a pair of said cylindrical inserts are positioned between each two adjacent blocks.

4. A percussion bit according to any one of the preceding claims which includes a fluid passage extending axially in said bit body from the end thereof opposite said working face to near said working face of the bit body, and further passage means communicating said fluid passage with the working face of the bit body.

5. A percussion bit according to Claim 4 in which said working face of said bit body is provided with groove means leading from the end of said further passage means laterally to the periphery of said working face.

6. A percussion bit according to any one of the preceding claims in which said bit body comprises axial flutes leading from the working face of the bit body at least partway along the length of the bit body.

7. A percussion bit according to Claim 6 in which said flutes include at least one flute disposed circumferentially between said blocks on each side of said bit body, each said flute communicating at one end with a said groove means.

8. A percussion bit according to any one of the preceding claims in which said bit body tapers inwardly from the working face end thereof toward the other end in at least the region adjacent said working face at an angle to the axis of between about 6 degrees and about 8 degrees.

9. A percussion bit according to any one of the preceding claims in which said bit body abruptly reduces in diameter at an axial region spaced along the bit body from the said working face thereof.

10. A percussion bit according to Claim 9 in which said bit body comprises relief undercuts extending from said axial region toward said working face of said bit body in the same axial planes of the bit body axis that contain the outer ends of said blocks, said relief undercuts terminating short of said blocks.

11. A percussion bit according to Claim1 in which said working face is beveled in the region of said holes for said cylindrical inserts.

12. A percussion bit according to Claim 1 in which the said wedge shaped protruding portions of said blocks angles upwardly at the outer ends of said blocks.

13. A percussion bit substantially as hereinbefore described with reference to and as illustrated in Figures 1 to 5 and 6 of the drawings.

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1228679 COMPLETE SPECIFICATION
1 SHEET This drawing is a reproduction of the Original on a reduced scale

FIG-1

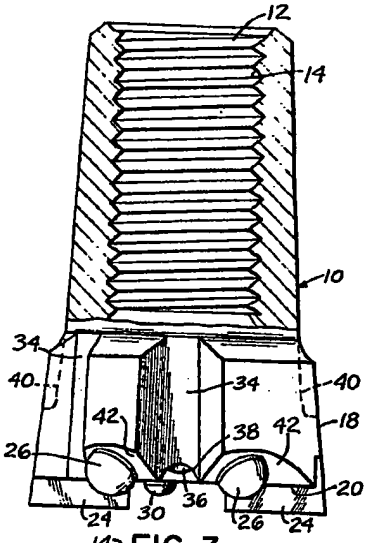

FIG-2

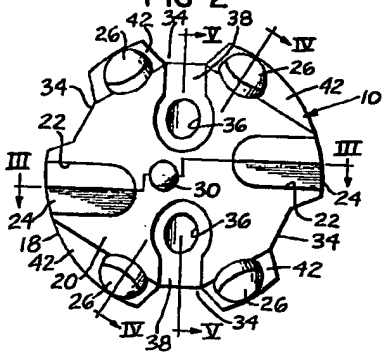

FIG-3

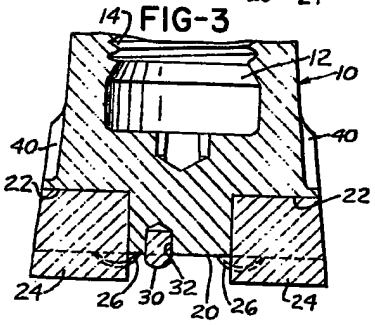

FIG-4

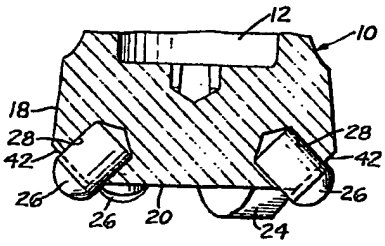

FIG-5

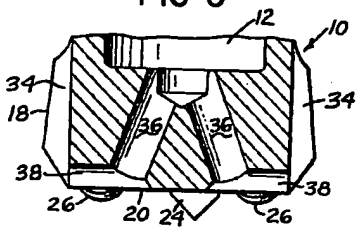

FIG-6